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VOL. 25 No 7.

BULLETIN

OF THE

TORREY BOTANICAL CLUB

JULY 1898

A Sketch of the Flora of the Canary Islands.

BY ALICE CARTER COOK.

The Canary Islands have the latitude of central Florida and are at the nearest point but seventy miles distant from the coast of the Sahara. Three islands lie to the east and three to the west of Tenerife, the largest member of the group, famous for its magnificent snow-capped volcano over 12,000 feet high. The geologic formation is entirely volcanic and the evidences of former seismic activity are everywhere apparent in the exceedingly mountainous, broken and jagged nature of the land surface.

The climate is semitropical and the average winter and summer temperatures differ only by about 10° C. There are clearly marked rainy and dry seasons—the former usually beginning in October and lasting until March. Whether the islands were once connected with the mainland or not is still a disputed question. The Challenger Report describes them as joined to Morocco and to Portugal by narrow submarine elevations. The flora has much in common with the Madeira and Cape Verde groups, but its general character is that of the Mediterranean region, including North Africa. A number of plants (species of *Erica*, *Umbilicus*, *Wahlenbergia*, *Romulea*, etc.) have South African affinities ; others (species of *Visnea*, *Phoebe*, *Bosea*, *Myrica*, etc.) Indian, and still others (species of *Pteris*, *Asplenium*, *Pinus*, *Salix*, etc.) American. But the large proportional number (414 out of 1,226) of species * peculiar to the islands proves long isolation. Knowledge of the distribution of Canary plants and comparative study of them and

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* Christ in Engler's Bot. Jahrb. **6** : 459–526. 1885.

[Issued 15 July 1898.]

of their nearest relatives has a bearing on many important questions of the geologic and biologic history of the archipelago, as well as upon the more general problems of the distribution of life. At present, however, such study is largely handicapped by the want of systematic work of a sufficiently thorough and final character. For instance, the great work of Webb and Berthelot includes a large number of species which later writers, notably the English botanists, have placed as synonyms of south European forms. Webb and Berthelot had, however, wide and practical preparatory acquaintance with the flora of the Spanish peninsula and the character of their work justifies the placing of a high value upon their judgment in the field, at least in comparison with that of others working with herbarium specimens only. They spent eight years on the islands, a far longer period than all their successors taken together. They seem, moreover, to have had very advanced ideas with reference to both genera and species and often approximated more closely in views and methods to American workers of the present day than to the Hookerian school of their own time. Still, many parts of their work need revision and the whole should be modernized and corrected in the light of recent discoveries and changes in nomenclature. Much might also be expected from a renewal of careful field work, especially in the eastern and western extremities of the archipelago which were not at all, or only slightly explored by Webb and Berthelot.

Fuerteventura and Lanzarote—the two most easterly islands—are rather more continental in vegetation than the others. Their original aspect can now hardly be imagined. Both are to-day absolutely destitute of forests. As Dr. Chil* says, "It is to be deplored that the first conquerors, as also the subsequent settlers of these islands, occupied themselves in destroying the woodland which there formed dense forests; their preservation would have been of immense benefit to the inhabitants who would not see, as they have for a long time been seeing, that the clouds seem to flee from their sky, and every ten years, at the least, the earth produces a half harvest, wherefore the people are obliged to migrate to the other islands or to the Americas, to secure a piece of bread."

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* "Estudios de las Islas Canarias."

Not infrequently three or four years pass without rainfall on these arid shores, and one must needs have heroic enthusiasm to brave the heat and drought of the desert climate in the search for botanical novelties. On Lanzarote there are two insignificant, almost inaccessible springs. Fuerteventura is somewhat better provided and, "when the waters of heaven remember its inhabitants," is said to be "of wonderful fertility"—in a wet year producing more wheat than all the other islands together and of a very fine quality. Its vegetation is described as "exceedingly varied and of the greatest interest to the botanist"—"a miniature reproduction of the parts of northern, desert Africa." Lanzarote has been more torn by volcanic action than any of the other islands, and the character of the plants is distinctively Saharan. In one group of hills the soil is still so heated that wood will burn in the crevices. These two islands together have 32 species which are either confined to them or found only rarely on the other islands. Webb and Berthelot enumerate 165 species from Lanzarote, 43 from Fuerteventura. They spent only seven weeks on the former and a very few days on the latter and were in neither at the most favorable times of the year. Much might be expected from a thorough tour of their hills and valleys.

Canary and Tenerife, the two central and largest islands of the archipelago, are the ones to which our own study was confined. They have many features in common, rocky coasts reaching back into bleak, volcanic wastes and fertile inland cut into by numberless valleys and gorges and here and there boasting a wonderful piece of dense, luxuriant woods which the conquerors in some mysterious way overlooked in their wholesale destruction of the once all-dominating forests. There are distinctly marked floral regions and each is characterized by some remarkable development of plant life.

Over the barren coast wastes are scattered clumps of fleshy plants, prominent among them *Euphorbia balsamifera.* Its fruticose stems reach a height of four or five feet, branch copiously, forming a circular crown, and bear rosettes of leaves at the apices of the ramifications. The shrubby *Euphorbia aphylla* also abounds in the maritime regions. Among the cylindrical branches of both of these species wind the filiform stems of the curious *Linaria* *heterophylla* or the spiny-leaved, coriaceous *Rubia fruticosa.* The former species has been reported only from Lanzarote, but we found it abundant on the waste near Galdar. The latter is peculiar to the islands and grows in ravines and on hillsides as well as on the arid plains. The Rubiaceae are further represented by another species of *Rubia*, a species each of *Vaillantia* and *Sherardia*, and several *Galiums*—all known also from Europe; by *Phyllis nobla* L., a species peculiar to the islands which we have never seen; and by the remarkable shrub *Plocama pendula*, which with its slender drooping branches and leaves much resembles a diminutive weeping willow. It remains green and flowers on the dry hillsides when even the fleshy *Euphorbias* have lost their foliage and almost all the vegetable world seems dead. The bell-shaped flowers are waxy white—turning black, as does the whole plant, in drying—and appear to be dioeciously dimorphic, *i. e.*, the long- and short-styled blossoms are on separate plants.

Asparagus pastorianus is another example of drought resistance. We found its spiny branches covered with fragrant white flowers on a desert hillside in the middle of July of an unusually dry year.

Besides the *Euphorbias* mentioned above, the islands abound in other species. The fruticose forms occupy the place of the cacti of the American deserts. Six out of eight of these shrubby species are confined to the Canaries. Among them is the celebrated *Euphorbia* which the Guauches used, as do their descendants to-day, to poison the water left by the retreating tide in deep pools on the shore—hypnotizing the fish, which rise to the surface and are captured and freshened in unpoisoned water. Then there is also the strange *Euphorbia Canariensis* growing in clumps ten to twelve feet in diameter and sometimes twenty feet high, which is a most striking feature of the hillsides. The square or hexagonal cactus-like stems are about three inches in diameter and the clusters have been compared to immense candelabra. In addition to the woody forms there are eleven herbaceous species, all except one of which are known from the Mediterranean region. These are so different from the shrubby *Euphorbias* as to make one wish for a revision of the genus.

Another characteristic plant of the volcanic wastes is the leafless *Senecio spinosus,* which is as uncomfortable to handle as a sea urchin, and when the stems are broken, has a most disagreeable odor. It is very frequently half hidden in dense coils of *Cuscuta episonchum,* peculiar to the island, a humble relative of the beautiful shrubby Convolvulaceae which adorn the hillsides. Ten of the seventeen Convolvulaceae of the islands are not found elsewhere, and five of these peculiar species are fruticose.

Other Compositae of the tufa are species of *Chrysanthemum, Picris, Urospermum, Senecio,* etc. It seems worthy of remark that many of these, as of the other species of the desert lands, of whatever family (Euphorbiaceae, Compositae, Umbelliferae, Plumbaginaceae, Labiatae) grow in dense clumps, probably as a means of increased resistance to transpiration in addition to such other adaptations as fleshy or much reduced foliage, hoariness or coriaceous texture. The contrast between the shore *Senecios* and the fleshy *Senecio Kleinia,* which is common in the ravines, makes one question the present status of our systems of classification. The Compositae are altogether well represented by seventy five genera, including about sixty five peculiar species. *Eupatorium ageratoides,* not reported by Webb and Berthelot, is very common in the barrancos of Firgas and Tafira. Thistles of many genera are a conspicuous and beautiful feature in all sorts of localities.

The genus *Statice* has nine species, all peculiar to the islands, found in rocky and maritime localities and most of them very limited in distribution, *e. g., S. papillata* is reported only from the little rocky islets Graciosa and Alegranza ; *S. brassicaefolia* only from Gomera.

Even more highly differentiated is the Labiate genus *Micromeria*—represented by seventeen species, all but one peculiar to the Canaries and that one found elsewhere only on Madeira and Porto Santo. These plants grow in arid places among rocks and on hillsides everywhere—the shore forms assuming the characteristic dense clump growth. *Salvia Canariensis* is another interesting member of this family. It is widely spread on the islands and we have found, besides the ordinary merely hirsute form, another with densely white-woolly leaves which may be a distinct species and also a third form with pure white flowers instead of the usual pink-purple ones.

The Borraginaceae are greatly developed. The bright flowers of *Echium plantagineum* are a very familiar sight in all kinds of habitats. We once found among the ordinary deep-blue-flowered plants a single specimen bearing pure-white blossoms. The giant spikes of the eleven fruticose species of the same genus—all peculiar to the archipelago—are conspicuous on the hillsides. Some of these are also decidedly local in their distribution. Dense mats of *Heliotropium erosum* cover large patches of dry, volcanic earth, while the sky-bright blossoms of *Myosotis* love the dampest places and the forest shade.

Another of our garden relatives, but again a peculiar species, is *Reseda scoparia*, which abounds on the volcanic wastes near Guia de Canaria, although we find it reported only from Tenerife and from the desert promontory at the northeast of Canary. Moreover, our garden "Nasturtium," *Tropaeolum majus*, not mentioned by Webb and Berthelot, grows profusely in damp places, evidently at home.

As one passes from the coast inland, he finds himself amongst a labyrinth of hills and mountains intersected by innumerable ravines or separated by broad valleys. Some of the hillsides are entirely covered with *Opuntia*, others are white with the flowers of *Cytisus* or *Retama*, others yellow with *Adenocarpus* or *Teline*, on others grow in profusion *Asphodelus*, *Gladiolus*, *Ferula*, *Andryala*, *Romulea*, etc., to the delight of the collector. The little native *Arisarum* springs from damp soil among the rocks as well as on the barren plains ; rarely one meets with a small colony of *Habenaria* on the wet cliffs. Ferns abound. *Davallia Canariensis* roots on the bare rocks or on forest trees indiscriminately. *Adiantum Capillus-Veneris* is still more abundant ; its delicate fronds grace every water-way or dripping cavern. *Trichomanes radicans* is found only in one locality, a dark gorge in the beautiful forest of Agua Garcia, in Tenerife, and another in Palma ; *Asplenium palmatum* roofs damp caves, and hangs from the precipitous cliffs which bound narrow gorges, and *Adiantum reniforme*—which is found otherwise only in Madeira—grows in similar places. The fragrant little *Cheilanthes pulchella*, called by the English tourists the "hay-scented fern," hides in the crevices of stone walls. *Notholaena marantea* is not uncommon on dry hillsides. Two species of *Dryopteris* and several *Aspleniums* grow profusely in the forests. *Pteris aquilina* and *Polypodium vulgare* var. *serrata* are omnipresent. The latter is a very different plant from the *Polypodium* of our North American woods and perhaps merits specific rank.

There are many plants which have so adapted themselves to the rocky character of the soil that they prefer the chinks and crevices of the cliffs to what would appear to be more comfortable footing, as the aborigenes of the country chose rather to live in caves than in properly constructed houses which they understood well how to make. Conspicuous among such are the Crassulaceae which reach their greatest development on these islands. About sixty species are known from the Atlantic islands, but about thirty-eight of these are exclusively Canarian. They range in size from the tiny *Sedum rubens* and *Pterophyes brachycaulon*, 2 to 6 inches in height, to the giant *Sempervivums* 2 to 3 feet long, which somehow manage to suspend their great rosettes of heavy, fleshy leaves and dense flower clusters, from most inaccessible and barren-looking cliffs. These form also a picturesque element of the urban flora of such old towns as Laguna and Firgas where they grow on the red-tiled roofs in company with a great, golden-flowered *Senecio*.

But the richest of the island vegetation is found in the great forests which still remain to indicate the former beauty of the archipelago. There are about twenty strictly arboreal forest species. In the south-central part of Canary, one may ride for hours beneath the shade of the native pine (*Pinus Canariensis*)—a species said to have existed in Europe during the Tertiary period but now found only on the Canaries, its nearest living relatives being Mexican species. The extensive forests of Mercedes and Agua Garcia in Tenerife contain four magnificent Lauraceae, *Phoebe barbusana*, *Ocotea foetens*, *Laurus Canariensis* and *Persea Indica*. All occur also in Madeira and the two latter in the Azores. There are two tree heaths found also in Europe; two tree species of *Ilex*, one confined to the Canaries, the other found also in Madeira; the beautiful *Prunus lusitanica* and *Myrica faya*; *Arbutus Canariensis*, a peculiar species, whose golden fruits resemble miniature oranges; and *Visnea mocanera*, the mocan of the Canarians from which the aborigines fermented an intoxicating liquor. The European olive grows wild in groves with *Pistacia lentiscus.* The Canary willow and the indigenous *Phoenix dactylifera* are not infrequent in the beds of wet barrancos, while the native species of *Tamarix* and a *Juniperus*, now almost extinct, prefer the dry ones. Occasionally one sees on a precipitous wall a solitary specimen or a little group of the famous *Dracaena Draco* from which the "dragon's blood," so highly valued as a charm, medicine, and dyestuff, was obtained by the medievals. The herbaceous element of the forest flora is rich in peculiar species such as *Campanula Canariensis, Cedronella Canariensis, Senecio appendiculatus*, etc.

Other unique plants are found in the great craters. The perfect bowl of the Bandama crater of Canary, whose charred sides look as if they had been scorched only yesterday, but which has in reality been extinct since historic times, is the home of several species ; so also is the ancient crater of Tiraxana on the same island. The immense crater of Palma is one of the most perfect in the world. The diameter of its base measures about six miles, and its walls are nearly seven thousand feet high. Its flora is of remarkable interest as it is one of the richest centers of peculiar species. The great peak of Tenerife itself is another hotbed of isolation ; twenty-one species that exist nowhere else are found on it and on the great circle of the Cañadas which surrounds it. It is curious that several species are confined to this peak region and to the great Palma crater forty-five miles away (*e. g.*, *Senecio palmensis*)—and that others not identical are closely related, *e. g.*, in each there is a peculiar but related species of *Viola* not found elsewhere. The old Guauche idea that the peak was originally thrown out of the crater of Palma is the only explanation of this phenomenon which we have yet heard suggested.